

**Massive laser damage of fused silica at 355 and 1064 nm  
initiated by surface contamination\***

F. Y. Génin, J. Furr, M. R. Kozlowski, and R. M. Brusasco,  
Lawrence Livermore National Laboratory,  
Livermore, California 94550.

Fused silica windows were artificially contaminated by depositing various materials onto the surface. The windows were tested using a 10-ns, 1064 nm and 3-ns, 355 nm laser. The morphology of the laser-induced damage was characterized by optical and scanning electron microscopy and by atomic force microscopy. The tests showed that damage could initiate and grow massively with repetitive shots.

Laser testing was conducted for contaminants on the input and the output surface of the windows. Front side contamination was found to have the potential for initiating massive back side damage. Back side contamination had also potentially a very negative influence on the optic's survivability. Damage at a given fluence was more severe at  $3\omega$  than  $1\omega$ . The contamination materials showed also to have a strong influence on the occurrence and morphology of the damage. The preliminary results of the study were used to provide a first set of standards for NIF and LMJ cleanliness requirements.

\*Work performed under the auspices of the U. S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.

*Abstract for the 1996 ICF conference*

**ICF-96-FG2**

Key words: laser-induced damage, fused silica, damage morphology, surface contamination, 355 nm, 1064 nm.